



Case Study 03

Basic data

Title of Research Teaching Unit	Travelling on a map with vectors
Unit created by	Istituto Comprensivo “Malaspina” – Massa (IT)
Based on Concept	Travelling on a map with vectors
Concept created by	Skola da Vinci (CZ)
Date of teaching	18.01.2024
Number of students in class	23
Number of migrant students	3

1. Unit Description of Research Teaching Unit

Title	Travelling on a map with vectors
Age of students/grade	Grade 7
Length of the unit	2 hours
Mathematical topic	Vectors - Properties of vectors
Prerequisite knowledge	<ul style="list-style-type: none">• Creation, reading and interpretation of graphs (on paper or on computer)
Materials needed	<ul style="list-style-type: none">• Online or paper maps• Tools for Geometry
Objectives	<ul style="list-style-type: none">• Modelling a journey using pairs of vectors• Using computer tools in Mathematics (Geogebra, a spreadsheet)• Developing students' ability to collect, analyze and study a range of data.• Cooperating in a group of students
Notes on work with migrant students	<ul style="list-style-type: none">• Basic lexicon related to coordinate Geometry• Some geographical concepts

Lesson plan

Lesson 1



At this point the students will describe the path, and they will be asked, even on the basis on their experiences, to give examples in which the vector sum does not correspond to the scalar sum.

For example: if you drink half a liter of water and then another half liter, you will drink a liter of water altogether. If instead you make a 1 km shift from point A to point B and then you move another Km from point B to point C, not necessarily the total displacement will be 2 km: it could be even smaller.

As a task the teacher can propose to the students to prepare examples of one case and the other, and then discuss them in class during the following lesson.

Lesson 2

The teacher will begin by discussing the paths traced on the maps, trying to bring into the discussion the foreign students, who can also talk about their experiences.

At the end of the discussion, the teacher will propose to sum the vectors (triangle method and parallelogram method), as a general procedure compared to the evaluations made in class by tracing the paths.

If possible, the teacher can try to solicit the discussion on how in reality the sum of vectors is more common than you think, leading to reflect on the forces and on how those are applied, so that you can have opposite results despite they have the same intensity.

For example, the students can be actively involved in the discussion by proposing to move a desk using forces of the same intensity and verse, but opposite directions or with the same intensity, verse and direction.

Although from the conceptual point of view it could be challenging, this type of teaching unit could allow, through practical applications, the participation of foreign students, thus leading to the acquisition of the mathematical concept of vector quantity.

2. Interview Analysis

The teacher teaching this unit has 12 years teaching experience. Her other subject is Science. She did not receive any training for teaching in multicultural classrooms neither in her initial nor in-service teacher training. In her prior teaching mathematics in these classrooms experience the most relevant issue she had encountered was related to migrant students who don't speak Italian. In this case, it is difficult even to understand if they understand what she is speaking about. Consequently, she tries to cooperate with a teacher specifically dedicated to support her in such circumstances. If this teacher is not available, she usually works creating peer to peer groups, because students of the same age can be more on familiar terms with their foreign classmates.

The advantages of having migrant students in the classroom are that there is something more which can be used in the lessons. You have to be more creative and to find new strategies for migrant students, but at the same time they have to be useful for the whole class. In addition, a multicultural class gives the students the chance to know more about different countries.

Some parts of the lesson plan were replaced by different activities:

Rather than starting from a fixed trip and following the course on a map, we made observations in class.

While one student remained with his eyes closed, another student moved through the class and then returned to the starting point. The others drew the path on the blackboard and on their notebooks.

Then we discussed on the fact that the student with his eyes closed didn't perceive any movement, while the other student made a journey before arriving at the starting point.

We then introduced the concept of vector, of vector size different from scale size.

Then we reflected on the part related to the proposed concept: difference between route and displacement, making an example of distance between two Italian cities and path necessary to reach them.

Thus the composition of several vectors results in a very different procedure than that relating to scalar sizes.

We then gave examples of vector sizes and scalar sizes.

Furthermore, instead of asking students to make just use of a map, they were asked to move in the classroom as to get a physical representation of vectors.

3. Improvement Suggestions

Lesson plan is suitable in the current form, but it is necessary to adapt the lesson to the composition of the class and the interests of the students. In our teaching, as described in the previous section 2. *Interview Analysis*, some parts of the lesson plan were therefore replaced by different activities.

4. Classroom observation

Students fairly participated in the lesson, especially in the first half of the activity and they cooperated in finding the solutions.

The climate was positive but the teacher had to intervene in order to involve all students.

From a motivational point of view, working in groups to solve real problems was suitable for all students, because peer tutoring helped students in troubles and led students to overcome some difficulties both in Maths and in text comprehension.

From a cognitive point of view, students enhanced the use of the formulas and their reasoning about problems.

The teaching unit made it possible to carry out an effective stimulus action for the brightest students: they were proud about sharing their ideas, being the spokesperson in their own group and in the final presentation of the work.

Among the methodological choices and inclusion strategies used for pupils with a migratory background, it was deemed necessary the distribution of formularies with the translation of some words used in Geometry and Science.